

DEVELOPING DEVICE

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Inventor(s): KONO HIROHISA;; KANEKO SHINTARO;; MURATA SHIGEMI;; HATTORI RYUJI;; OKAMOTO TETSUJI

Applicant(s): FUJI XEROX CO LTD

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Abstract

PROBLEM TO BE SOLVED: To make it unnecessary to replace a recovering container until the recovering container becomes almost full of deteriorated developer and, furthermore, to recover it at a low cost by providing a recovery control means which stops the operation of a developing-unit main body at a point of time when it is judges that developer supplied to the developing-unit main body has reached a specific amount.

SOLUTION: A detection sensor 51 for detecting an amount of recovery is attached to the recovering container 5, and the output signal of the detection sensor 51 is inputted to the recovery control means composed of a microcomputer. In order to prevent unnecessary replacement of the recovering container 5 and reduce replacement cost by using the capacity of the recovering container 5 to the fullest extent, the recovery control means 52 totals, after the detection of deteriorated developer by the detection sensor 51, the lengths of the time that a developer replenishment motor 33 is driven are integrated. Then, based the value of the total, it checks whether the remaining capacity of the recovering container 5 is full of the deteriorated developer 7 or not. When judging that it is full, the recovery control means inhibits the drive of a driving motor 28 in order to inhibits the operation of the developing device.

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(71)出願人 000005496

富士ゼロックス株式会社
東京都港区赤坂二丁目17番22号

(72)発明者 河野 裕久

神奈川県海老名市本郷2274番地、富士ゼロ
ックス株式会社内

(72)発明者 金子 伸太郎

神奈川県海老名市本郷2274番地、富士ゼロ
ックス株式会社内

(72)発明者 村田 重美

神奈川県海老名市本郷2274番地、富士ゼロ
ックス株式会社内

(74)代理人 弁理士 中村 智廣 (外3名)

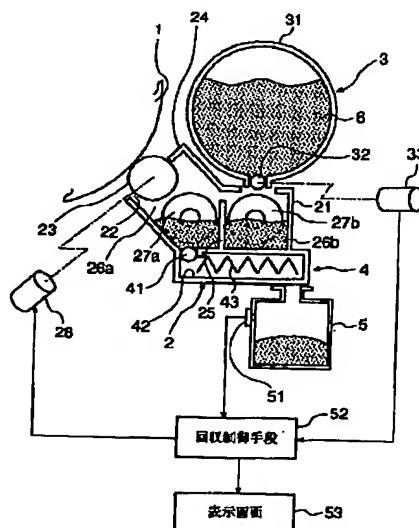
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(54)【発明の名称】 現像装置

(57)【要約】 (修正有)

【課題】劣化した現像剤を徐々に回収容器に排出しながら新旧現像剤の交換を自動的に行う現像装置において、回収容器が劣化現像剤で略満杯となるまで回収容器の交換を行う必要がなく、しかも低コストでこれを実現することが可能な現像装置を提供する。

【解決手段】現像器本体2に対して現像剤6を補給する現像剤供給手段3と、現像器本体2から劣化した現像剤を排出すると共に、かかる劣化現像剤を回収容器5内に収容する現像剤回収手段4とを備えた現像装置を前提とし、回収容器5内に収容された劣化現像剤が所定量に達したことを検知する回収量検知手段51を設ける一方、かかる回収量検知手段51による劣化現像剤の検知後、現像剤供給手段3から現像器本体2に補給された現像剤が所定量に達したと判断された時点で、現像器本体2の動作を停止する回収制御手段52を設けた。



- 1: 感光体 1*2A (像担持体)
- 2: 現像器本体
- 3: 現像剤供給手段
- 4: 現像剤回収手段
- 5: 回収容器
- 51: 検知手段 (回収量検知手段)

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【特許請求の範囲】

【請求項1】 トナー及びキャリアを含む現像剤を用いて像担持体上に形成された静電潜像を現像し、該像担持体上にトナー像を形成するする現像器本体と、この現像器本体に対して現像剤を補給する現像剤供給手段と、上記現像器本体から劣化した現像剤を排出すると共に、かかる劣化現像剤を回収容器内に収容する現像剤回収手段とを備えた現像装置において、上記回収容器内に収容された劣化現像剤が所定量に達したことを検知する回収量検知手段を設ける一方、かかる回収量検知手段による劣化現像剤の検知後、上記現像剤供給手段から現像器本体に補給された現像剤が所定量に達したと判断された時点で、上記現像器本体の動作を停止する回収制御手段を設けたことを特徴とする現像装置。

【請求項2】 請求項1記載の現像装置において、上記回収制御手段は上記像担持体上に形成されるトナー像の画像密度の積算値に基づいて上記現像器本体に対する現像剤の補給量を把握することを特徴とする現像装置。

【請求項3】 請求項1記載の現像装置において、上記回収制御手段は現像剤供給手段の駆動時間の積算値に基づいて上記現像器本体に対する現像剤の補給量を把握することを特徴とする現像装置。

【発明の詳細な説明】**【0001】**

【発明の属する技術分野】 本発明は、電子写真複写機等の画像形成装置において、トナー及びキャリアが所定の割合で混合攪拌された二成分現像剤を用いて感光体ドラム上の静電潜像を現像する現像装置に係り、特に、時経過等に伴って劣化した現像剤を現像器本体から徐々に回収しながら現像器本体内の現像剤の入替えを行う現像装置の改良に関する。

【0002】

【従来の技術】 トナー及びキャリアからなる二成分現像剤を用いて静電潜像の現像を行う現像装置では、これらトナーとキャリアとを現像器本体内で混合攪拌することによって該トナーを所定の電位に摩擦帶電しているが、かかる攪拌動作を繰り返すと上記キャリアの表面には次第にトナーが付着し、該キャリアは時経過に伴って徐々に劣化していく。このため、長期にわたって現像剤（主としてキャリア）を交換することなく使用した場合、トナーを所望の電位に摩擦帶電させることができ難となり、静電潜像を現像して得られた記録画像にカブリ等の画像欠陥が生じてしまう。

【0003】 従って、二成分現像剤を用いる現像装置では劣化キャリアを含む全ての現像剤を定期的に現像器本体から出し、かかる現像剤の交換作業を行うことが必要とされる。しかし、かかる交換作業に当たってはトナーが周辺空気_ADDRESS_に飛散し易いことから、この交換作業を一般ユーザに行わせるのは困難であり、また、この交換

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作業を専門のサービスエンジニアに頼っていたのでは保守管理に手間が掛かり過ぎる。

【0004】 そこで、特公平2-21591号公報や特開平4-118675号公報には、静電潜像によって消費されたトナーのみを現像器本体に逐次補給するのではなく、かかるトナーの補給と併せてキャリアの補給を行い、キャリアの補給によって增量した分の現像剤を現像器本体外に設けられた回収容器に徐々に排出し、これによって現像器本体内の現像剤の入れ替えを人手を煩わすことなく自動的に行う現像装置が提案されている。

【0005】 この現像装置では新たなトナー、新たなキャリアが現像器本体に補給されると、これら補給トナー及び補給キャリアと混合攪拌された現像剤のうち、劣化したキャリアを含む余剰な現像剤が少量ずつ回収容器に排出されていくことから、特に現像剤の交換作業を行うことなく、現像器本体内のキャリアを徐々に新たなキャリアと入れ換えることができ、現像器本体内における劣化キャリアの発生を抑えつつ静電潜像の現像を継続的に行うことができるものである。

【0006】

【発明が解決しようとする課題】 ところで、このような従来の現像装置にあっては前述の如く回収容器に劣化した現像剤が排出されていくことから、回収容器が満杯になった時点で該回収容器を新たなものと交換しなければならないが、かかる容器の交換作業を専門のサービスエンジニアに行わせたのでは、やはり保守管理にコストや手間が掛かり過ぎ、せっかく現像剤の交換を自動的に行わせている意義が没却されてしまう。

【0007】 従って、かかる観点からすれば、上記回収容器の交換作業は複写機等を使用するユーザ自らに行わせるのが望ましいと言えるが、そのためには回収容器の交換時期をユーザに対して自動的に明示するシステムが必要となる。

【0008】 回収容器の交換が必要か否かをユーザに明示するもっとも簡易な方法としては、回収容器内の劣化現像剤の量が所定量に達したことを検知する検知センサを設け、かかる検知センサの出力信号に基づいて回収容器内の劣化現像剤の量を判断する手法がある。しかし、回収容器が劣化現像剤で満杯になった時点で上記検知センサが作動するように設定したのでは、ユーザの手元に新たな回収容器が準備されていない場合に、劣化現像剤が回収容器から溢れるのを防止するため、新たな回収容器を入手する迄の間は現像装置の駆動を停止しなければならず、その間、ユーザは複写作業を行うことが不可能となってしまう。

【0009】 一方、ユーザが新たな回収容器を入手する迄の期間を考慮し、回収容器が満杯になる以前の段階で該回収容器の交換をユーザに対して促すように上記検知センサの設定を調整することも可能ではあるが、余りに早く回収容器の交換を促したのでは、劣化現像剤が該回

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収容器の容量に全く満たない時点で交換が行われてしまう場合が多くなり、ユーザーにしてみれば交換コスト及び交換頻度が増加して不便である。

【0010】かかる観点からすれば、回収容器が劣化現像剤で満杯になる僅かに手前の段階でユーザーに対して新たな回収容器の準備を促すのが良いと考えられるが、そのためには劣化現像剤が回収容器から溢れ出る事故を防止すべく、回収容器が満杯になったことを正確に把握する手段が必要であった。

【0011】かかる手段としては第2の検知センサを設けて、この検知センサにより回収容器が満杯になったことを把握すれば足りるのだが、検知センサの数を増やすとその分だけ生産コストが嵩む他、該センサの出力信号を処理するI/Oポートも余分に必要となり、この点からも生産コストが嵩むといった問題点があった。

【0012】本発明はこのような問題点に鑑みなされたものであり、その目的とするところは、劣化した現像剤を徐々に回収容器に排出しながら新旧現像剤の交換を自動的に行う現像装置において、上記回収容器の交換を促されたユーザが新たな回収容器を準備する期間を確保しつつ、かかる回収容器が劣化現像剤で略満杯となるまで回収容器の交換を行う必要がなく、しかも低コストでこれを実現することが可能な現像装置を提供することにある。

【0013】

【課題を解決するための手段】上記目的を達成するために、本発明の現像装置は、トナー及びキャリアを含む現像剤を用いて像担持体上に形成された静電潜像を現像し、該像担持体上にトナー像を形成するする現像器本体と、この現像器本体に対して現像剤を補給する現像剤供給手段と、上記現像器本体から劣化した現像剤を排出すると共に、かかる劣化現像剤を回収容器内に収容する現像剤回収手段とを備えた現像装置を前提とし、上記回収容器内に収容された劣化現像剤が所定量に達したことを検知する回収量検知手段を設ける一方、かかる回収量検知手段による劣化現像剤の検知後、上記現像剤供給手段から現像器本体に補給された現像剤が所定量に達したと判断された時点で、上記現像器本体の動作を停止する回収制御手段を設けたことを特徴とするものである。

【0014】このような技術的手段によれば、現像器本体から排出された劣化現像剤は現像剤回収手段によって回収容器内へ収容されるが、かかる回収容器内の劣化現像剤が所定量に到達すると、上記回収量検知手段がこれを検知することから、この回収量検知手段の出力信号に基づきユーザに対して新たな回収容器の準備を促すことができる。また、回収量検知手段による劣化現像剤の検知後、回収容器を交換することなく引き続いて劣化現像剤が現像器本体から回収容器に排出される場合には、回収量検知手段による劣化現像剤の検知後に上記現像剤供給手段から現像器本体に補給された現像剤が所定量に達

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したと判断された時点で、上記回収制御手段が現像器本体の動作を停止し、それ以上劣化現像剤が回収容器に排出されるのを防止する。

【0015】ここで、上記現像剤供給手段によって現像剤が現像器本体に補給された場合、補給された量と同量のキャリアを現像器本体から回収容器へ排出しなければ、現像器本体内における現像剤の量は徐々に増加してしまい、最終的には現像剤が現像器本体から溢れ出てしまう。従って、現像器本体から回収容器に排出される劣化現像剤の量は現像剤供給手段によって現像器本体に供給された補給キャリアの量と略同等に設定される必要があり、現像器本体に供給された補給現像剤の量を把握すれば、回収容器に排出された劣化現像剤の量を略正確に把握することができる。

【0016】従って、本発明の現像装置によれば、現像剤供給手段による現像剤の供給量をパラメータとして、劣化現像剤の検知手段を複数用いることなく、回収容器が満杯になるタイミングを略正確に把握することができ、劣化現像剤を回収容器の容量一杯まで回収することができるものである。

【0017】一方、本発明においては、上記回収制御手段が上記現像剤供給手段から現像器本体に供給された現像剤の量を把握し、かかる把握に基づいて回収容器が劣化現像剤で満杯になるタイミングを判断するが、通常、現像器本体に供給される現像剤の量は静電潜像の現像によって消費されたトナーの量に基づいて決定され、かかる消費トナー量は像担持体上に形成されるトナー像の画素密度と関連している。従って、上記回収制御手段は像担持体上に形成されるトナー像の画素密度の積算値を把握することで、上記現像器本体に対する現像剤の供給量を予測することができる。

【0018】もっとも、現像するトナー像の濃度設定、原稿画像に対する色変換、温湿度等の環境の影響で、トナー像の画素密度と現像器本体に対する現像剤の供給量が完全に対応していない場合もあることから、トナー像の画素密度に基づいて現像器本体に供給される現像剤の量を予測したのでは、正確な供給量を把握することができず、ひいては上記回収制御手段が回収容器の満杯を判断する以前の時点で該回収容器が満杯になってしまう懸念もある。従って、現像器本体へ供給される補給現像剤の量を正確に把握するという観点からすれば、上記現像剤供給手段の駆動時間の積算値、すなわち現像器本体に対する現像剤の供給時間の積算値に基づいて現像剤の補給量を把握するのが好ましい。このように構成すれば、現像器本体に対する現像剤の補給量を直接的に把握することができるので、回収容器に対する劣化現像剤の排出量も正確に把握することができ、かかる回収容器が満杯になるタイミングを正確に判断することが可能となる。

【0019】

【発明の実施の形態】以下、添付図面に基づいて本発明

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の現像装置を詳細に説明する。図1は本発明を適用した電子写真複写機の現像装置の実施例を示すものである。同図において、符号1は画情報に応じて静電潜像が形成される感光体ドラム、符号2はこの感光体ドラム1上に形成された静電潜像をトナー及びキャリアからなる二成分現像剤で現像する現像器本体、符号3はこの現像器本体2に対して新たな現像剤を供給する現像剤供給手段、符号4は上記現像器本体2内から劣化した現像剤を排出させる現像剤回収手段、符号5は排出された劣化現像剤を収容する回収容器である。

【0020】上記現像器本体2のハウジング21には上記感光体ドラム1との対向位置に現像剤の搬出口22が開設される一方、この搬出口22には現像剤の磁気ブラシを形成する現像ロール23が配設されている。この現像ロール23は複数の磁極が着磁されたマグネットロールの周囲を矢線方向へ回動する円筒状スリーブで覆って形成されており、かかるマグネットロールの磁力によって磁性キャリアをスリーブの周面に鎖状に吸着して現像剤の磁気ブラシを形成する一方、スリーブの回動に伴って該磁気ブラシを上記搬出口22からハウジング21の外部へ搬出し、磁気ブラシの穂立ちで感光体ドラム1を摺擦するように構成されている。尚、上記ハウジング21には現像ロール23と所定の間隙を保ってトリマーブレード24が設けられており、現像ロール23の周面に形成された磁気ブラシの穂立ちの長さを切り揃えるように構成されている。

【0021】また、上記ハウジング21の内部には現像ロール23の軸方向と平行に隔壁25が立設されており、この隔壁25によってハウジング21の内部は二つの現像剤室26a、26bに区分されている。上記現像ロール23を含む第1現像剤室26aには現像ロール23と隣接してスクリューオーガ27aが配設されており、このスクリューオーガ27aは矢線方向への回動に伴って第1現像剤室26a内の現像剤を現像器2のフロント側（紙面垂直方向手前側）に向けて搬送する。一方、隔壁25を挟んで第1現像剤室26aに隣接する第2現像剤室26bにもスクリューオーガ27bが配設されており、このスクリューオーガ27bは矢線方向への回動に伴って第2現像剤室26b内の現像剤を現像器2のリヤ側（紙面垂直方向奥側）に向けて搬送する。

【0022】更に、上記隔壁25のフロント側及びリヤ側の両端には第1現像剤室26aと第2現像剤室26bとを連通連結する開口が形成されており、スクリューオーガ27aの回転によって第1現像剤室26a内のフロント側に搬送してきた現像剤はフロント側開口を介して第2現像剤室26bへ移動する一方、スクリューオーガ27bの回転によって第2現像剤室26b内のリヤ側に搬送してきた現像剤はリヤ側開口を介して第1現像剤室26aへ移動するように構成されている。すなわち、この現像器2では一対のスクリューオーガ27a、

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27bが回転すると、現像剤が上記隔壁25の周囲を一定の方向へ循環し、かかる循環に伴って現像剤の攪拌がなされ、トナーの摩擦帶電が促進されるようになっている。尚、スクリューオーガ27a、27bは上記現像ロール23と共に駆動モータ28に接続されており、現像ロール23が回動すると、スクリューオーガ27a、27bも回動して現像剤の循環・攪拌がなされるようになっている。

【0023】一方、このように構成された現像器本体2に対して現像剤を供給する現像剤供給手段3は、トナー及びキャリアの混合された補給現像剤6を収容する補給容器31と、この補給容器31から上記現像器本体2の第2現像剤室26bに補給現像剤6を落とし込むディスペンスロール32と、このディスペンスロール32を駆動する現像剤補給モータ33とから構成されており、ディスペンスロール32の回転数に比例した量の補給現像剤6が現像器本体2の第二現像剤室26bに落とし込まれるようになっている。上記現像ロール23が駆動されて感光体ドラム1上の静電潜像が現像されると、現像器本体2内ではキャリアが消費されることなくトナーのみが消費されていくことから、現像器本体内におけるトナーとキャリアの混合比率を適正な値に保持すべく、上記補給現像剤6中にはトナーが過剰に含まれている。従って、かかる補給現像剤6を現像器本体2内の現像剤と混合攪拌すると、現像器本体2内におけるキャリアの総量は増加するものの、トナーとキャリアの混合比率が適正な値に維持され、感光体ドラム1上の静電潜像を一定の濃度で現像することができる。

【0024】これに対して上記現像剤回収手段4は、現像器本体2の第1現像剤室26aの底部に設けられた排出ロール41と、この排出ロール41によって第1現像剤室26aから排出された劣化現像剤を回収容器5に導く回収通路42と、この回収通路42内に配設されて劣化現像剤の搬送を行うスクリューオーガ43とから構成されている。補給現像剤6にはキャリアが含まれていることから、上記現像剤供給手段3によって現像器本体2に補給現像剤6を加えていくと、前述の如く現像器本体2内におけるキャリアは增量の一途を辿り、最終的には現像剤が第一及び第二現像剤室26a、26bから溢れ出てしまうことになる。従って、上記排出ロール41は現像剤供給手段3のディスペンスロール32と同期して回転し、上記補給容器31から第二現像剤室26bに加えられた現像剤の総量に対して所定割合の現像剤を第1現像剤室から上記回収通路42へと排出する。

【0025】そして、以上のように構成された本実施例の現像装置においては、感光体ドラム1上に静電潜像が形成されると、駆動モータ28によって現像ロール23及びオーガ27a、27bが駆動され、かかる静電潜像がトナーによって現像される。また、静電潜像の現像が開始されると、例えばこの静電潜像の画像密度等に基づ

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いてトナーの消費量が算出され、ディスペンスローラ32が回動してトナー消費量に対応した量の現像剤が補給容器31から現像器本体2に補給される。一方、上記ディスペンスローラ32が回動すると、これに動悸した所定のタイミングで排出ローラ41も回動し、現像器本体2内の劣化現像剤が回収通路42を通して回収容器5へと排出され、かかる回収容器5には徐々に劣化現像剤が堆積していく。

【0026】次に、本実施例の現像装置において上記回収容器5の満杯を検知するための構成について説明する。上記回収容器5には回収量を検知する検知センサ51が取り付けられており、かかる検知センサ51の出力信号はマイクロコンピュータから構成される回収制御手段52に入力されるようになっている。図2に示すように、回収容器5に対する検知センサ51の取り付け位置は該回収容器5の容量の略80%に対応する位置であり、かかる検知センサ51が劣化現像剤7を検知しても、回収容器5には二点鎖線で囲んだ量だけ更に劣化現像剤7を回収することが可能である。

【0027】従って、上記回収制御手段52は検知センサ51の出力信号から回収容器の略80%にまで劣化現像剤7が堆積したか否かを判断し、堆積したと判断される場合には画像形成装置に備えられた表示画面53を制御して、回収容器5の満杯が近いこと並びに交換に必要な新たな回収容器5を準備すべきことをユーザーに対して警告する。

【0028】また、上記回収容器5の容量を目一杯利用して回収容器5の交換の無駄及び交換コストの低減を図るため、上記回収制御手段52は検知センサ51による劣化現像剤の検知後は現像剤補給モータ33の駆動時間を積算し、かかる積算値に基づいて回収容器5の残りの容量(図2の二点鎖線で囲まれた容量)が劣化現像剤7で満杯になったか否かをチェックする。

【0029】上記ディスペンスローラ32はその回転時間に比例した量の補給現像剤6を補給容器31から現像器本体2に落とし込むことから、かかるディスペンスマータ32を駆動する現像剤補給モータ33の駆動時間の積算値は現像器本体2に対する現像剤6の補給量を表していると言える。また、上記排出ローラ41はディスペンスローラ32に同期して回転しており、現像剤の補給量から一義的に決定される量の劣化現像剤7を現像器本体2から回収容器5へ排出している。ここで、ディスペンスローラ32による単位時間当たりの現像剤供給速度をV、現像剤補給モータ33の駆動時間の積算値をt、検知センサ51のON後における回収容器5の残りの容量をW、現像剤補給量と排出量との間に存在する比例定数(実験により求める)をkとすれば、これらの数値がVt = kWの関係を満たした時に回収容器5が略満杯になると言える。

【0030】従って、検知センサ51が劣化現像剤7を

検出して以降、上記回収制御手段52は前述の如く現像剤補給モータ33の駆動時間の積算値tをチェックし、かかるtがVt = kWの関係を満たしたならば、回収容器5の残りの容量が劣化現像剤7で満杯になったものと判断し、現像装置の稼働を禁止すべく駆動モータ28の駆動を禁止する。これにより、以降はディスペンスローラ32が駆動することはないので、これに同期して回転する排出ローラが駆動されることもなく、劣化現像剤7が回収容器5へ排出されるのを防止し得ると共に、かかる劣化現像剤7が回収容器5から溢れ出るを防止することが可能となる。

【0031】そして、かかる後に上記回収制御手段52は表示画面53を制御して回収容器5が満杯になったこと、回収容器5を新たな容器に交換しなければならないことをユーザに知らせ、回収容器5が交換されることを検知した場合には上記駆動モータ28の駆動禁止を解除する。

【0032】上記回収容器5が満杯になったか否かを判断する手法としては、検知センサ51が劣化現像剤7を検知した後に画像形成動作が行われた記録シート枚数をカウントし、かかるシート枚数に基づいて回収容器5が劣化現像剤7で満杯になったか否かを判断する手法が考えられる。しかし、図3に示すように、記録シートに形成された記録画像の画像密度が異なれば、かかる記録画像の形成のために消費されたトナーの量も異なり、ひいては現像器本体2に対する補給現像剤6の供給量も異なることから、記録シート1ページ当たりの劣化現像剤7の回収量も異なってしまう。従って、検知センサ51が劣化現像剤7を検知した後、回収容器5が満杯になるまでに画像形成を行うことが可能な記録シートの枚数は記録画像の画像密度に応じて異なったものとなり、記録シートの枚数のみをもって回収容器5の満杯を判別した場合、まだ劣化現像剤7を収容する容量があるにもかかわらず、回収容器5が満杯と誤って判別してしまう懸念がある。

【0033】しかし、本実施例の現像装置では現像剤補給モータ33の駆動時間の積算値、すなわち現像器本体2に対する補給現像剤6の供給量に基づいて回収容器5が満杯になるタイミングを検知しており、しかも現像器本体2に対する補給現像剤6の供給量と回収容器5に対する劣化現像剤7の排出量との間には比例的な関係が存在することから、回収容器5が満杯になるタイミングを略正確に把握することができるものである。

【0034】従って、回収容器5の容量がまだ残っているにもかかわらず現像装置の駆動を禁止してしまい、記録画像の形成を行うことができなくなってしまうといったトラブルを回避することができる他、回収容器5の無駄な交換を防止して回収容器5の交換コストの低減化を図ることもできる。

【0035】尚、本実施例では現像剤補給モータ33の

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駆動時間の積算値に基づいて現像器本体2に対する補給現像剤6の供給量を把握し、かかる供給量から回収容器5に対する劣化現像剤7の排出量を予測したが、現像剤補給モータ33の駆動時間は現像工程におけるトナーの消費量に応じて決定され、しかもかかるトナー消費量は感光体ドラム1上に現像されるトナー像の画像密度によって決定されることから、現像剤補給モータ33の駆動時間の積算値を参照することなく、現像によって形成されるトナー像の画像密度に基づいて回収容器5に対する劣化現像剤7の排出量を予測し、回収容器の満杯のタイミングを把握することも可能である。

【0036】また、現像器本体2から回収容器5に対する劣化現像剤7の排出は必ずしも排出ローラ41を用いて行う必要はなく、現像剤供給手段3の動作により現像器本体2内で增量した分の現像剤を回収容器5へ溢れこぼすようにして行っても良い。

【0037】

【発明の効果】以上説明してきたように、本発明の現像装置によれば、現像剤供給手段による現像剤の供給量をパラメータとすることで、劣化現像剤の検知手段を複数

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用いることなく、回収容器が満杯になるタイミングを略正確に把握して、劣化現像剤を回収容器の容量一杯まで回収することができるので、上記回収容器の交換を促されたユーザが新たな回収容器を準備する期間を確保しつつ、かかる回収容器が劣化現像剤で略満杯となるまで回収容器の交換を行う必要がなく、回収容器の交換頻度を低く抑えることができる他、交換に要するコストの低減化をも実現することが可能となる。

【図面の簡単な説明】

【図1】 本発明の現像装置の実施例を示す概略構成図である。

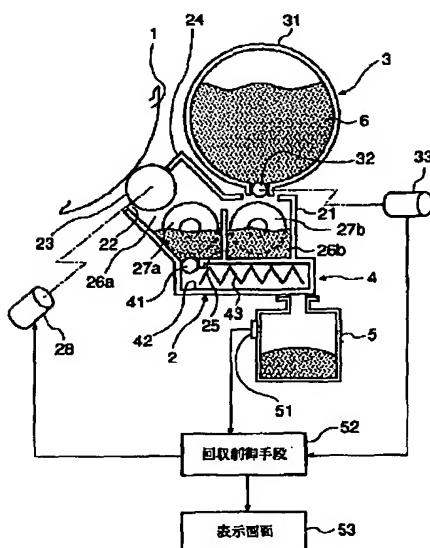
【図2】 実施例に係る回収容器を示す断面図である。

【図3】 現像により形成する記録画像の画像密度に応じて現像剤の回収量及びコピー可能な記録シートの枚数が異なることを示すグラフである。

【符号の説明】

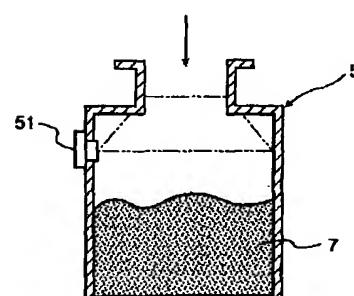
1…感光体ドラム（像担持体）、2…現像器本体、3…現像剤供給手段、4…現像剤回収手段、5…回収容器、51…検知センサ（回収量検知手段）

【図1】

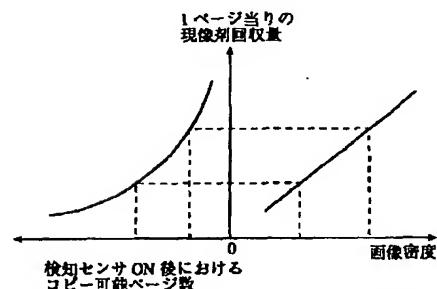


- 1: 感光体ドラム（像担持体）
- 2: 現像器本体
- 3: 現像剤供給手段
- 4: 現像剤回収手段
- 5: 回収容器
- 51: 検知センサ（回収量検知手段）

【図2】



【図3】



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フロントページの続き

(72)発明者 服部 龍治
神奈川県海老名市本郷2274番地、富士ゼロ
ックス株式会社内

(72)発明者 岡本 哲二
神奈川県海老名市本郷2274番地、富士ゼロ
ックス株式会社内

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CLAIMS

[Claim(s)]

[Claim 1] The main part of a development counter which develops the electrostatic latent image formed on the image support using the developer containing a toner and a carrier, and forms a toner image on this image support. A developer supply means to supply a developer to this main part of a development counter. A developer recovery means to hold this degradation developer in the container for recycling while discharging the developer which deteriorated from the above-mentioned main part of a development counter. While having established an amount detection means of recoveries detect that the degradation developer which is the developer equipped with the above and was held in the above-mentioned container for recycling reached the specified quantity, when the developer supplied from the above-mentioned developer supply means to the main part of a development counter after detection of the degradation developer by this amount detection means of recoveries is judged to have reached to the specified quantity, it carries out having prepared the recovery control means stop operation of the above-mentioned main part of a development counter as the feature.

[Claim 2] It is the developer characterized by grasping the amount of supply of the developer to the above-mentioned main part of a development counter based on the integrated value of the picture density of the toner image with which the above-mentioned recovery control means are formed on the above-mentioned image support in a developer according to claim 1.

[Claim 3] It is the developer characterized by the above-mentioned recovery control means grasping the amount of supply of the developer to the above-mentioned main part of a development counter in a developer according to claim 1 based on the integrated value of the drive time of a developer supply means.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to improvement of the developer which replaces the developer in the main part of a development counter in image formation equipments, such as an electrophotography copying machine, collecting gradually from the main part of a development counter charge, especially the developers with which it deteriorated with progress etc. at the time to the developer which develops the electrostatic latent image of photo conductor drum lifting using the two component developer by which mixed stirring of a toner and the carrier was carried out at a predetermined rate.

[0002]

[Description of the Prior Art] although triboelectrification of this toner is carried out to predetermined potential by carrying out mixed stirring of these toners and the carrier within the main part of a development counter in the developer which develops an electrostatic latent image using the two component developer which consists of a toner and a carrier, if this stirring operation is repeated -- the front face of the above-mentioned carrier -- gradually -- a toner -- adhering -- this carrier -- the time -- progress -- following -- gradually -- deteriorating . For this reason, when it is used without exchanging developers (mainly carrier) over a long period of time, it will become difficult to carry out triboelectrification of the toner to desired potential, and picture defects, such as fogging, will produce an electrostatic latent image in the record picture developed and acquired.

[0003] Therefore, in the developer using a two component developer, all the developers containing a degradation carrier are periodically discharged from the main part of a development counter, and to do the exchange work of this developer is needed. However, since a toner tends to disperse in circumference atmosphere in this exchange work, it is difficult to make this exchange work do on a general user, and maintenance control takes time and effort too much in having depended for this exchange work on the special service engineer.

[0004] then, to JP,2-21591,B or JP,4-118675,A Only the toner consumed by the electrostatic latent image is not serially supplied to the main part of a development counter. Combine with supply of this toner, also perform supply of a carrier, and the developer of the part which increased by supply of a carrier is gradually discharged in the container for recycling in which it was prepared to the development counter book outside of the body. The developer which performs automatically exchange of the developer in the main part of a development counter by this, without troubling a help is proposed.

[0005] If a toner new in this developer and a new carrier are supplied to the main part of a development counter The inside of the developer by which mixed stirring was carried out with these supply toner and the supply carrier, From the surplus developer containing the carrier which deteriorated being discharged by the container for small quantity [every] recycling An electrostatic latent image can be developed continuously, being able to replace gradually the carrier in the main part of a development counter with a new carrier, and stopping the degradation generation of carriers in the main part of a development counter without doing especially the exchange work of a developer.

[0006]

[Problem(s) to be Solved by the Invention] by the way, from the developer which deteriorated in the container for recycling like the above-mentioned being discharged if it is in such a conventional developer Although this container for recycling must be exchanged for a new thing when the container for recycling fills, in having made the exchange work of this container do on a special service engineer Maintenance control will take cost and time and effort too much too, and meaning made to exchange developers automatically with much trouble will be ****(ed).

[0007] Therefore, if it carries out from this viewpoint, although it can say that it is desirable to make the exchange work of the above-mentioned container for recycling do on the user himself who uses a copying machine etc., the system which for that specifies the exchange stage of the container for recycling automatically to a user is needed.

[0008] The detection sensor which detects that the amount of the degradation developer in the container for recycling reached the specified quantity as a reasonable simple method of specifying to a user whether the container for recycling needs to be exchanged is formed, and there is the technique of judging the amount of the degradation developer in the container for recycling based on the output signal of this detection sensor. however, in having set up so that the above-mentioned detection sensor might operate when the container for recycling filled with the degradation developer Having to stop the drive of a developer until the new container for recycling comes to hand, in order to prevent that a degradation developer overflows from the container for recycling, when the new container for recycling is not prepared to the user, a user will be impossible [doing copy work] in the meantime.

[0009] Although it is also possible to adjust a setup of the above-mentioned detection sensor so that exchange of this container for recycling may be demanded from a user in the stage before the container for recycling fills in consideration of a period until a user, on the other hand, receives the new container for recycling it having been not much alike and having urged exchange of the container for recycling early -- if -- the case where exchange is performed when a degradation developer does not fulfill the capacity of this container for recycling at all -- increasing -- a user -- then, exchange cost and exchange frequency increase and are inconvenient

[0010] Although **** to which the container for recycling fills with a degradation developer and to which preparation of the new container for recycling is slightly urged to a user in a front stage was considered to be good when carrying out from this viewpoint, a means to grasp correctly that the container for recycling filled that the accident on which for that a degradation developer overflows from the container for recycling should be prevented was required.

[0011] Although it was sufficient when having grasped that formed the 2nd detection sensor as this means, and the container for recycling filled by this detection sensor, when the number of detection sensors was increased, the production cost increased, and also the I/O Port which processes the output signal of this sensor was also needed for the excess, and only the part had the trouble that a production cost increased also from this point.

[0012] The place which this invention is made in view of such a trouble, and is made into the purpose In the developer which exchanges an old and new developer automatically while discharging the developer which deteriorated in the container for recycling gradually It is not necessary to exchange the container for recycling until it becomes full of a degradation developer omitting this container for recycling, the user from whom exchange of the above-mentioned container for recycling was demanded securing the period which prepares the new container for recycling, and it is in offering the developer which can moreover realize this by the low cost.

[0013]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the developer of this invention The main part of a development counter which develops the electrostatic latent image formed on the image support using the developer containing a toner and a carrier, and forms a toner image on this image support, While discharging a developer supply means to supply a developer to this main part of a development counter, and the developer which deteriorated from the above-mentioned main part of a development counter It is premised on the developer equipped with a developer recovery means to

hold this degradation developer in the container for recycling. While establishing an amount detection means of recoveries to detect that the degradation developer held in the above-mentioned container for recycling reached the specified quantity After detection of the degradation developer by this amount detection means of recoveries, when the developer supplied to the main part of a development counter from the above-mentioned developer supply means is judged to have reached the specified quantity, it is characterized by preparing the recovery control means which stop operation of the above-mentioned main part of a development counter.

[0014] According to such technical means, since the above-mentioned amount detection means of recoveries will detect this if the degradation developer in this container for recycling reaches the specified quantity although the degradation developer discharged from the main part of a development counter is held into the container for recycling by the developer recovery means, based on the output signal of this amount detection means of recoveries, preparation of the new container for recycling can be demanded from a user. moreover, when a degradation developer is successingly discharged from the main part of a development counter by the container for recycling, without exchanging the container for recycling after detection of the degradation developer by the amount detection means of recoveries When the developer supplied to the main part of a development counter from the above-mentioned developer supply means after detection of the degradation developer by the amount detection means of recoveries is judged to have reached the specified quantity, the above-mentioned recovery control means stop operation of the main part of a development counter, and it prevents that a degradation developer is discharged more than it by the container for recycling.

[0015] Here, if the supplied carrier of an amount and the amount of said is not discharged from the main part of a development counter to the container for recycling when a developer is supplied to the main part of a development counter by the above-mentioned developer supply means, the amount of the developer in the main part of a development counter increases gradually, and finally, a developer overflows from the main part of a development counter, and keeps it by appearance. Therefore, the amount of the degradation developer discharged from the main part of a development counter by the container for recycling needs to be set as the amount and abbreviation EQC of a supply carrier which were supplied to the main part of a development counter by the developer supply means, and if the amount of the supply developer supplied to the main part of a development counter is grasped, it can grasp the amount of the degradation developer discharged by the container for recycling to abbreviation accuracy.

[0016] therefore, according to the developer of this invention, by making the amount of supply of the developer by the developer supply means into a parameter, without using two or more detection meanses of a degradation developer, the timing to which the container for recycling fills can be grasped to abbreviation accuracy, and the container for recycling can carry out until [capacity full] recovery of the degradation developer

[0017] On the other hand, although the above-mentioned recovery control means judge the timing to which the amount of the developer supplied to the main part of a development counter from the above-mentioned developer supply means is grasped, and the container for recycling fills with a degradation developer based on this grasp in this invention Usually, the amount of the developer supplied to the main part of a development counter is determined based on the amount of the toner consumed by the development of an electrostatic latent image, and this amount of consumption toners is connected with the pixel density of the toner image formed on an image support. Therefore, the above-mentioned recovery control means can predict the amount of supply of the developer to the above-mentioned main part of a development counter by grasping the integrated value of the pixel density of the toner image formed on an image support.

[0018] By but environmental influence, such as a concentration setup of the toner image to develop, color conversion to a manuscript picture, and temperature and humidity When the amount of supply of the developer to the pixel density and the main part of a development counter of a toner image does not correspond completely, from a certain thing In having predicted the amount of the developer supplied to the main part of a development counter based on the pixel density of a toner image, there is also concern

to which this container for recycling fills with the time before it cannot grasp the exact amount of supply, as a result the above-mentioned recovery control means judge **** of the container for recycling. Therefore, if the amount of the supply developer supplied to the main part of a development counter is carried out from a viewpoint of grasping correctly, it is desirable to grasp the amount of supply of a developer based on the integrated value of the supply time of a developer to the integrated value, i.e., the main part of a development counter, of drive time of the above-mentioned developer supply means. Thus, if constituted, since the amount of supply of the developer to the main part of a development counter can be grasped directly, the discharge of a degradation developer to the container for recycling can also be grasped correctly, and becomes possible [judging correctly the timing to which this container for recycling fills].

[0019]

[Embodiments of the Invention] Hereafter, based on an accompanying drawing, the developer of this invention is explained in detail. Drawing 1 shows the example of the developer of the electrophotography copying machine which applied this invention. The photo conductor drum on which, as for a sign 1, an electrostatic latent image is formed in this drawing according to drawing information, The main part of a development counter which develops the electrostatic latent image by which the sign 2 was formed on this photo conductor drum 1 by the two component developer which consists of a toner and a carrier, A developer supply means by which a sign 3 supplies a new developer to this main part 2 of a development counter, a developer recovery means to make the developer with which the sign 4 deteriorated out of the above-mentioned main part 2 of a development counter discharge, and a sign 5 are containers for recycling which hold the discharged degradation developer.

[0020] While the taking-out mouth 22 of a developer is established by the housing 21 of the above-mentioned main part 2 of a development counter in an opposite position with the above-mentioned photo conductor drum 1, the development roll 23 which forms the magnetic brush of a developer is arranged by this taking-out mouth 22. This development roll 23 is covered and formed with the cylinder-like sleeve which rotates the circumference of the magnet roll with which two or more magnetic poles were magnetized in the direction of an arrow. While adsorbing a magnetic carrier in the shape of a chain at the peripheral surface of a sleeve and forming the magnetic brush of a developer by the magnetism of this magnet roll This magnetic brush is taken out from the above-mentioned taking-out mouth 22 to the exterior of housing 21 with rotation of a sleeve, and it is constituted so that the photo conductor drum 1 may be ****(ed) by the chain-like cluster of a magnetic brush. In addition, the development roll 23 and a predetermined gap are maintained at the above-mentioned housing 21, and the trimer blade 24 is formed, and it is constituted so that the length of the chain-like cluster of the magnetic brush formed in the peripheral surface of the development roll 23 may be cut to an even length.

[0021] Moreover, the septum 25 is set up by the shaft orientations of the development roll 23, and parallel inside the above-mentioned housing 21, and the interior of housing 21 is classified into two developer rooms 26a and 26b by this septum 25. The development roll 23 is adjoined at 1st developer room 26a including the above-mentioned development roll 23, screw auger 27a is arranged, and with the rotation to the direction of an arrow, this screw auger 27a turns the developer in 1st developer room 26a to the front side (space perpendicular direction near side) of a development counter 2, and conveys it. On the other hand, screw auger 27b is arranged also in 2nd developer room 26b which adjoins 1st developer room 26a on both sides of a septum 25, and with the rotation to the direction of an arrow, this screw auger 27b turns the developer in 2nd developer room 26b to rear ** (space perpendicular direction back side) of a development counter 2, and conveys it.

[0022] Furthermore, opening which carries out free passage connection of 1st developer room 26a and the 2nd developer room 26b is formed in the front side of the above-mentioned septum 25, and the ends of rear **. While the developer conveyed by rotation of screw auger 27a at the front side in 1st developer room 26a moves to 2nd developer room 26b through front side opening The developer conveyed by rotation of screw auger 27b at rear ** in 2nd developer room 26b is constituted so that it may move to 1st developer room 26a through rear *****. That is, in this development counter 2, if the screw augers 27a and 27b of a couple rotate, a developer will circulate through the circumference of the

above-mentioned septum 25 in the fixed direction, stirring of a developer will be made with this circulation, and the triboelectrification of a toner will be promoted. In addition, if the screw augers 27a and 27b are connected to the drive motor 28 with the above-mentioned development roll 23 and the development roll 23 rotates, the screw augers 27a and 27b will also rotate, and circulation and stirring of a developer will be made.

[0023] A developer supply means 3 to supply a developer to the main part 2 of a development counter constituted in this way on the other hand The supply container 31 which holds the supply developer 6 with which the toner and the carrier were mixed, The dispensing roll 32 which drops the supply developer 6 into 2nd developer room 26b of the above-mentioned main part 2 of a development counter from this supply container 31, It consists of developer supply motors 33 which drive this dispensing roll 32, and the supply developer 6 of the amount proportional to the rotational frequency of the dispensing roll 32 is dropped into second developer room 26b of the main part 2 of a development counter. If the above-mentioned development roll 23 drives and the electrostatic latent image on the photo conductor drum 1 is developed, since only the ***** toner with which a carrier is consumed is consumed, within the main part 2 of a development counter, the toner is superfluously contained in the above-mentioned supply developer 6 that the mixed ratio of a toner and a carrier in the main part of a development counter should be held to a proper value. therefore -- if mixed stirring of this supply developer 6 is carried out with the developer in the main part 2 of a development counter, although the total amount of the carrier in the main part 2 of a development counter will increase -- the mixing ratio of a toner and a carrier -- a rate is maintained by the proper value and the electrostatic latent image on the photo conductor drum 1 can be developed by fixed concentration

[0024] On the other hand, the above-mentioned developer recovery means 4 consists of screw augers 43 which are arranged in the recovery path 42 which leads the degradation developer discharged from 1st developer room 26a to the container 5 for recycling, and this recovery path 42, and convey a degradation developer with the eccrisis roll 41 formed in the pars basilaris ossis occipitalis of 1st developer room 26a of the main part 2 of a development counter, and this eccrisis roll 41. Since the carrier is contained in the supply developer 6, when the supply developer 6 is added to the main part 2 of a development counter by the above-mentioned developer supply means 3, like the above-mentioned, increase in quantity of the carrier in the main part 2 of a development counter is enhanced, finally, a developer will reach for a start and it will overflow from the second developer rooms 26a and 26b. Therefore, the above-mentioned eccrisis roll 41 rotates synchronizing with the dispensing roll 32 of the developer supply means 3, and discharges the developer of a predetermined rate from the 1st developer room to the above-mentioned recovery path 42 to the total amount of the developer added to second developer room 26b from the above-mentioned supply container 31.

[0025] And in the developer of this example constituted as mentioned above, if an electrostatic latent image is formed on the photo conductor drum 1, the development roll 23 and Augers 27a and 27b will drive with a drive motor 28, and this electrostatic latent image will be developed by the toner. Moreover, if the development of an electrostatic latent image is started, the consumption of a toner is computed, for example based on the picture density of this electrostatic latent image etc., the dispensing roller 32 will rotate and the developer of the amount corresponding to toner consumption will be supplied to the main part 2 of a development counter from the supply container 31. On the other hand, if the above-mentioned dispensing roller 32 rotates, the eccrisis roller 41 also rotates to the predetermined timing which carried out the trepidatio cordis to this, the degradation developer in the main part 2 of a development counter is discharged through the recovery path 42 to the container 5 for recycling, and the degradation developer deposits on this container 5 for recycling gradually.

[0026] Next, the composition for detecting **** of the above-mentioned container 5 for recycling in the developer of this example is explained. The detection sensor 51 which detects the amount of recoveries is attached in the above-mentioned container 5 for recycling, and the output signal of this detection sensor 51 is inputted into the recovery control means 52 which consist of microcomputers. As shown in drawing 2, the installation position of the detection sensor 51 to the container 5 for recycling is a position corresponding to 80% of the abbreviation for the capacity of this container 5 for recycling, and

even if this detection sensor 51 detects the degradation developer 7, in the container 5 for recycling, only the amount enclosed with the two-dot chain line can collect the degradation developers 7 further.

[0027] Therefore, the above-mentioned recovery control means 52 control the display screen 53 with which image formation equipment was equipped, when it is judged from the output signal of the detection sensor 51 that it judged whether the degradation developer 7 deposited even to 80% of the abbreviation for the container for recycling, and deposited on them, and **** of the container 5 for recycling warns of what the new container 5 for recycling required for and [near] and near exchange should be prepared for to a user.

[0028] Moreover, in order to aim at reduction of the futility of exchange of the container 5 for recycling, and exchange cost, using the capacity of the above-mentioned container 5 for recycling with all its might, it checks [whether in the above-mentioned recovery control means 52, after detection of the degradation developer by the detection sensor 51 integrated the drive time of the developer supply motor 33, and the remaining capacity (capacity surrounded with the two-dot chain line of drawing 2) of the container 5 for recycling filled with the degradation developer 7 based on this integrated value, and].

[0029] Since the above-mentioned dispensing roller 32 drops the supply developer 6 of the amount proportional to the turnover time into the main part 2 of a development counter from the supply container 31, the integrated value of the drive time of the developer supply motor 33 which drives this dispensing motor 32 can be said to express the amount of supply of the developer 6 to the main part 2 of a development counter. Moreover, the above-mentioned eccrisis roller 41 is rotating synchronizing with the dispensing roller 32, and has discharged the degradation developer 7 of the amount of supply to the amount of a developer determined uniquely from the main part 2 of a development counter to the container 5 for recycling. Here, the proportionality constant (it asks by experiment) which exists the remaining capacity of the container 5 for recycling [the developer speed of supply per unit time with the dispensing roller 32] after ON of t and the detection sensor 51 of the integrated value of the drive time of V and the developer supply motor 33 between W, the amount of developer supply, and a discharge can be said that the container 5 for recycling fills abbreviation when k, then these numeric values fill the relation of $Vt=kW$.

[0030] Therefore, after the detection sensor 51 detects the degradation developer 7, if the integrated value t of the drive time of the developer supply motor 33 is checked and this t fills the relation of $Vt=kW$ like the above-mentioned, the above-mentioned recovery control means 52 will judge it as that to which the remaining capacity of the container 5 for recycling filled with the degradation developer 7, and will forbid the drive of a drive motor 28 that operation of a developer should be forbidden. While being able to prevent by this that the degradation developer 7 is discharged to the container 5 for recycling, without the eccrisis roller which rotates synchronizing with this driving since the dispensing roller 32 does not drive henceforth, this degradation developer 7 becomes possible [overflowing from the container 5 for recycling and preventing **].

[0031] And a user is told about that the above-mentioned recovery control means 52 controlled the display screen 53, and the container 5 for recycling filled, and having to exchange the container 5 for recycling for a new container in this back, and when it is exchanged and the container 5 for recycling detects things, the ban on the drive of the above-mentioned drive motor 28 is canceled.

[0032] As the technique of judging whether the above-mentioned container 5 for recycling filled, after the detection sensor 51 detects the degradation developer 7, the record sheet number of sheets in which image formation operation was performed is counted, and the technique of judging whether based on this sheet number of sheets, the container 5 for recycling filled with the degradation developer 7 can be considered. However, if the picture densities of the record picture formed in the record sheet differ as shown in drawing 3, the amounts of the toner consumed for formation of this record picture also differ, as a result since the amount of supply of the supply developer 6 to the main part 2 of a development counter also differs, the amounts of recoveries of the degradation developer 7 per page 1 of a record sheet will also differ. Therefore, the number of sheets of the record sheet which can perform image formation by the time the container 5 for recycling fills, after the detection sensor 51 detects the degradation developer 7 becomes a different thing according to the picture density of a record picture.

Although there is capacity which still holds the degradation developer 7 when **** of the container 5 for recycling is distinguished only with the number of sheets of a record sheet, there is concern which the container 5 for recycling distinguishes accidentally [be / full].

[0033] In the developer of this example, however, the integrated value of the drive time of the developer supply motor 33, Namely, the timing to which the container 5 for recycling fills based on the amount of supply of the supply developer 6 to the main part 2 of a development counter is detected. And since a-like proportionally relation exists between the amount of supply of the supply developer 6 to the main part 2 of a development counter, and the discharge of the degradation developer 7 to the container 5 for recycling, the timing to which the container 5 for recycling fills can be grasped to abbreviation accuracy.

[0034] Therefore, although the capacity of the container 5 for recycling still remains, the drive of a developer is forbidden, the trouble of it becoming impossible to form a record picture is avoidable, and also useless exchange of the container 5 for recycling can be prevented, and reduction-ization of the exchange cost of the container 5 for recycling can also be attained.

[0035] In addition, although the amount of supply of the supply developer 6 to the main part 2 of a development counter is grasped based on the integrated value of the drive time of the developer supply motor 33 and the discharge of the degradation developer 7 to the container 5 for recycling was predicted from this amount of supply in this example According to the consumption of the toner in a development process, it decides on the drive time of the developer supply motor 33. and from being determined with the picture density of the toner image developed on the photo conductor drum 1, this toner consumption It is also possible to predict the discharge of the degradation developer 7 to the container 5 for recycling based on the picture density of the toner image formed of development, and to grasp the full timing of the container for recycling, without referring to the integrated value of the drive time of the developer supply motor 33.

[0036] Moreover, it is not necessary to necessarily perform discharge of the degradation developer 7 to the container 5 for recycling using the discharge roller 41 from the main part 2 of a development counter, and it overflows, and as the developer of the part which increased within the main part 2 of a development counter by operation of the developer supply means 3 is spilt to the container 5 for recycling, you may go it to it.

[0037]

[Effect of the Invention] As explained above, according to the developer of this invention, the amount of supply of the developer by the developer supply means by considering as a parameter since the timing to which the container for recycling fills can be grasped to abbreviation accuracy and the container for recycling can carry out until [capacity full] recovery of the degradation developer, without using two or more detection meaneses of a degradation developer The user from whom exchange of the above-mentioned container for recycling was demanded securing the period which prepares the new container for recycling It is not necessary to exchange the container for recycling, and the exchange frequency of the container for recycling can be low stopped until it becomes full of a degradation developer omitting this container for recycling, and also it becomes possible to also realize reduction-ization of the cost which exchange takes.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram showing the example of the developer of this invention.

[Drawing 2] It is the cross section showing the container for recycling concerning an example.

[Drawing 3] It is the graph which shows that the amount of recoveries of a developer differs from the number of sheets of the record sheet which can be copied according to the picture density of the record picture formed by development.

[Description of Notations]

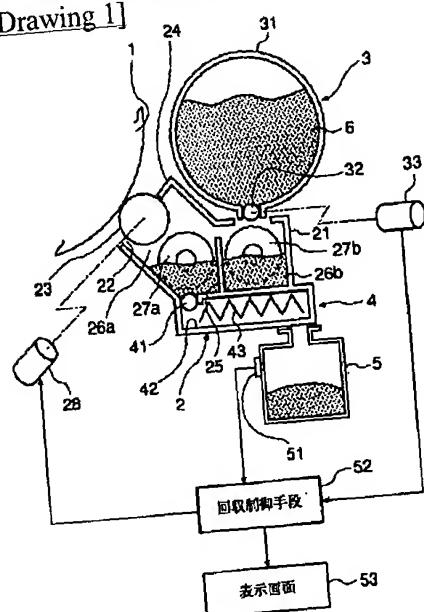
1 [-- A developer supply means, 4 / -- A developer recovery means, 5 / -- The container for recycling, 51 / -- Detection sensor (the amount detection means of recoveries)] -- A photo conductor drum (image support), 2 -- The main part of a development counter, 3

[Translation done.]

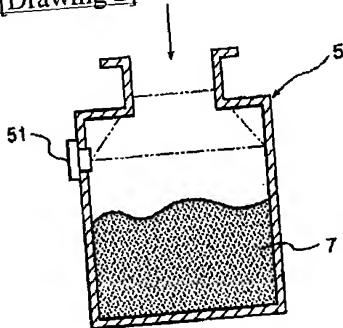
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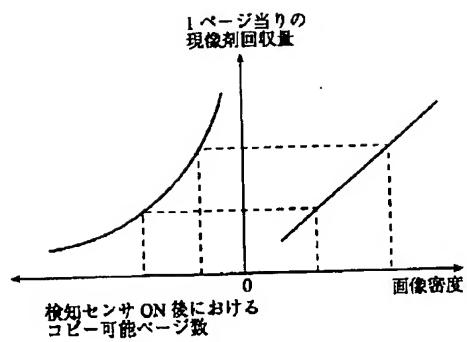
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DRAWINGS**[Drawing 1]**

- 1: 感光体 1~3 (像担持体)
 2: 现像部本体
 3: 现像剂供给手段
 4: 现像剂回收手段
 5: 回收容器
 51: 检知手段 (回収量検知手段)

[Drawing 2]**[Drawing 3]**

8/22/2003



[Translation done.]